

Trend Study 16A-1-97

Study site name: Strawberry Highline Canal.

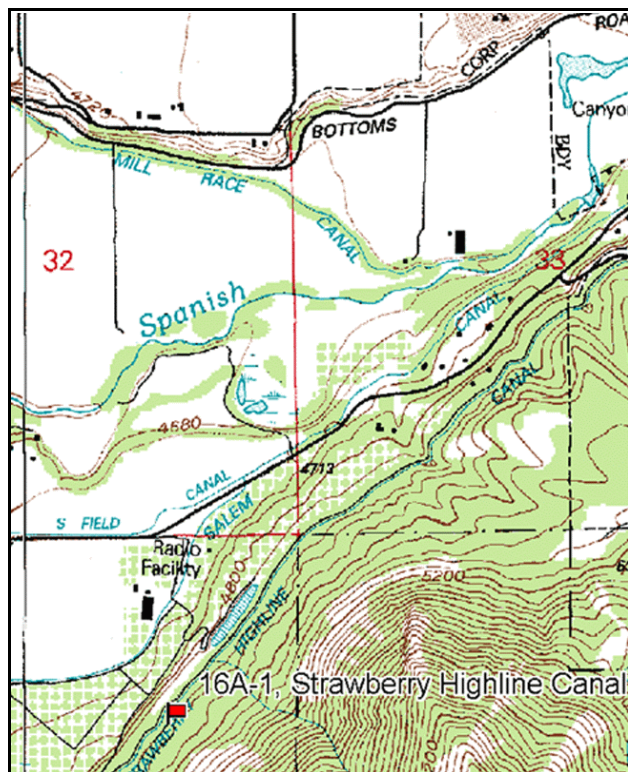
Vegetation type: Mixed Oak-Sage.

Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11, 34, 59, 71 & 95ft).

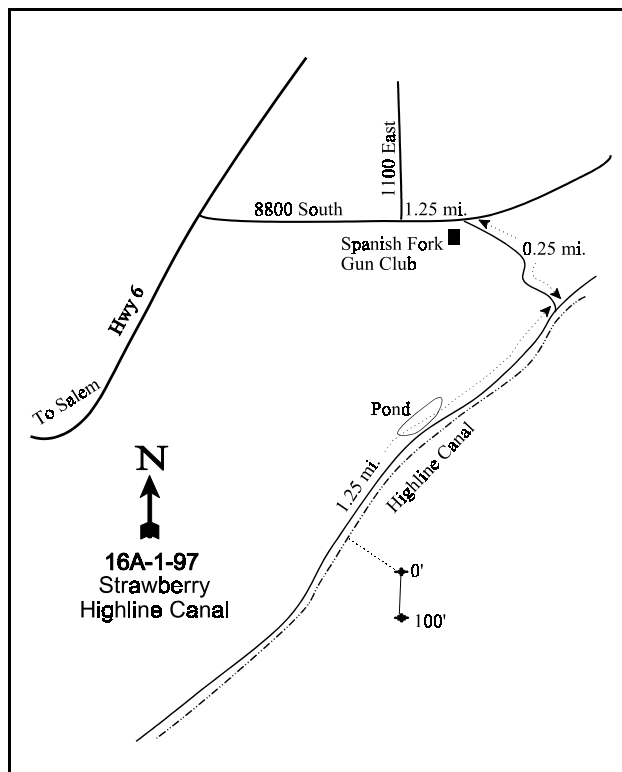
LOCATION DESCRIPTION

Beginning at the intersection of 8800 South and 1150 East (north of Salem), proceed east on 8800 South for 1.25 miles to an intersection. Turn right (i.e., south) at the intersection and proceed 0.25 miles to the High Line Canal Road. Turn right onto the High Line Canal Road and proceed southwest for 1.4 miles. From the road, walk 54 paces at an azimuth of 114 degrees true, to the 0-foot baseline stake. You must cross the canal at this point. This azimuth is from the northernmost tower in the orchard located immediately to the west. The study is marked by green steel "T" fenceposts approximately 12 to 18 inches in height.



Map Name: Spanish Fork Peak

Township 9S, Range 3E, Section 5



Diagrammatic Sketch

GPS: NAD 27, UTM 12S 4435113 N 447137 E

DISCUSSION

Strawberry Highline Canal - Trend Study No. 16A-1

*****SUSPENDED** - This site was suspended in 2002. The area consists of small sagebrush openings surrounded by mature Gambel clones which are increasing in cover and density. The site narrative and data tables are included from the 1997 report.

The Strawberry Highline Canal study is located within critical deer winter range just above the canal, approximately 2½ miles southwest of Spanish Fork Canyon. The area sampled is a mixed Gambel oak and mountain big sagebrush community with a sparse grass-forb understory. The herbaceous understory makes up only 29% of the total vegetative cover. The site is located on the upper Lake Bonneville terrace at an elevation of approximately 5,000 feet. Slope is about 10% to 15%. Judging from the levels of use of the principle browse and the number of pellet groups observed in 1983 and 1989, the area received limited deer use. During the 1997 reading, only one deer pellet group was encountered and use of the sagebrush was light. Oak clones are becoming more dense and reducing the size of the sagebrush openings. Due to a lack of sagebrush openings to sample, all five belts were left on the original baseline instead of lengthening the baseline to 400 feet (see methods). This appears to be a poor site that will likely be dropped from the list in the future.

Soil at the site is deep and well drained with an effective rooting depth (see methods) estimated at 21 inches. It is derived from lacustrine deposits from Lake Bonneville. Small sized gravel pavement is common on the soil surface and throughout the profile. Soil has a loam texture with a neutral pH of 6.9. Although the slope is relatively gentle, the erosion hazard is severe. During the 1983 reading, there was abundant evidence of ongoing soil loss at the site. Soil pedestalling was common that year and erosion channels and gullies were present. Currently, soil erosion does not seem serious with little bare soil (8%). However, herbaceous cover is limited with grasses and forbs combining to produce only 12% cover.

Browse composition is dominated by Gambel oak, interspersed with numerous small mountain big sagebrush openings. Gambel oak dominates the site by providing 71% of the browse cover. It appears to be an expanding population with high numbers of sprouts and young plants. Its density has steadily increased from 3,299 stems/acre in 1983, to 4,432 in 1989, and 6,120 by 1996. Oak appears not to be utilized and in good vigor. Insect infestations reduced the vigor on 59% of the oak in 1983. The more preferred mountain big sagebrush has remained at a fairly constant density of around 2,000 plants/acre despite high numbers of seedling and young plants. Utilization is light and vigor normal on most plants. Percent decadency has declined from a high of 35% in 1989 to 17% in 1996. However, 76% of the decadent plants sampled in 1997, were classified as dying. Young plants are abundant enough to replace decadent, dying plants.

Broom snakeweed is also found on the site in moderate numbers. Density peaked in 1989 when the population was estimated at 5,332 plants/acre. It has since declined by 50% to 2,640 plants/acre. Age class analysis indicates a dynamic population with an extraordinary number of seedlings (5,840 seedlings/acre) and a high proportion of young plants (36%).

The herbaceous understory is somewhat depleted, especially in the sagebrush openings. These areas are dominated by bluebunch wheatgrass, Kentucky bluegrass and Beckwith milkvetch. Annual grasses are also fairly common. The understory plants associated with Gambel oak are generally of better quality and more numerous.

1983 APPARENT TREND ASSESSMENT

Soil is stable to declining. Ground cover is highly variable and noticeable erosion is occurring. This is especially evident in the big sagebrush openings where annual grasses are more prevalent. Indicators of vegetative trend suggest that Gambel oak is slowly thickening and probably encroaching into openings. This trend, if it continues, will gradually eliminate the mosaic-like nature of the area resulting in detrimental effects on big game habitat. Management objectives should encourage development and maintenance of healthy big sagebrush-grass forb communities in the oak openings.

1989 TREND ASSESSMENT

The soil trend appears stable with similar ground cover characteristics. There is little evidence of current soil erosion, although the erosion hazard is severe on this soil type. Trend for sagebrush is currently stable. Photo and data comparisons indicate improved production and recruitment in the big sagebrush component. However, population density remained similar with percent decadency increasing from 29% to 35%. Hedging remains light to moderate and canopy cover averages 8%. Gambel oak has increased 26%, while broom snakeweed increased 76%. The understory in the sagebrush openings remains in a depleted condition, but there was less cheatgrass and a few more perennial grasses and forbs observed in 1989 indicating a slightly improving trend.

TREND ASSESSMENT

soil - stable (3)

browse - stable, but density of broom snakeweed should be closely watched (3)

herbaceous understory - up slightly, but still poor (4)

1997 TREND ASSESSMENT

The soil trend appears stable with a slight decline in percent bare soil as well as a minor decline in percent litter cover. Erosion is limited by the gentle terrain and the thick oak clones. Trend for sagebrush is also stable with a similar population density compared to the 1989 estimate. Percent decadence declined from 35% to 17% with 76% of these appearing to be dying. Use remains light. Oak continues to increase, while the density of broom snakeweed declined by 50%. Trend for the herbaceous understory is stable. Annual grasses are common accounting for 31% of the grass cover.

TREND ASSESSMENT

soil - stable (3)

browse - stable (3)

herbaceous understory - stable, but still poor (3)

HERBACEOUS TRENDS --

Herd unit 16A, Study no: 1

| Type | Species | Nested Frequency | | | Quadrat Frequency | | | Average Cover % |
|------|---------------------|------------------|------------------|-----------------|-------------------|-----|-----|-----------------|
| | | '83 | '89 | '97 | '83 | '89 | '97 | '97 |
| G | Agropyron spicatum | _a 64 | _b 110 | _b 97 | 25 | 42 | 36 | 2.60 |
| G | Bromus spp. | - | - | 55 | - | - | 16 | .62 |
| G | Bromus tectorum (a) | - | - | 91 | - | - | 27 | .88 |
| G | Festuca myuros (a) | - | - | 29 | - | - | 13 | .06 |
| G | Koeleria cristata | - | - | 3 | - | - | 1 | .03 |
| G | Poa bulbosa | _a - | _a - | _b 15 | - | - | 8 | .31 |
| G | Poa pratensis | _a 16 | _a 3 | _b 39 | 5 | 2 | 11 | 2.20 |

| Type | Species | Nested Frequency | | | Quadrat Frequency | | | Average Cover % |
|-----------------------------|------------------------------------|------------------|-----------------|-----------------|-------------------|-----|-----|-----------------|
| | | '83 | '89 | '97 | '83 | '89 | '97 | '97 |
| G | <i>Poa secunda</i> | _b 66 | _b 59 | _a 31 | 27 | 24 | 13 | .36 |
| G | Unknown grass - annual (a) | - | - | 118 | - | - | 38 | .91 |
| Total for Annual Grasses | | 0 | 0 | 238 | 0 | 0 | 78 | 1.86 |
| Total for Perennial Grasses | | 146 | 172 | 240 | 57 | 68 | 85 | 6.13 |
| Total for Grasses | | 146 | 172 | 478 | 57 | 68 | 163 | 8.00 |
| F | <i>Agoseris glauca</i> | 1 | - | 3 | 1 | - | 1 | .00 |
| F | <i>Alyssum alyssoides</i> (a) | - | - | 79 | - | - | 29 | .27 |
| F | <i>Allium</i> spp. | 2 | - | - | 2 | - | - | - |
| F | <i>Arabis</i> spp. | 1 | 1 | 2 | 1 | 1 | 1 | .00 |
| F | <i>Astragalus beckwithii</i> | _a - | _a - | _b 10 | - | - | 5 | 1.35 |
| F | <i>Aster chilensis</i> | 5 | 8 | 8 | 2 | 4 | 3 | .44 |
| F | <i>Balsamorhiza sagittata</i> | - | - | 5 | - | - | 3 | .43 |
| F | <i>Calochortus nuttallii</i> | - | 3 | 2 | - | 1 | 1 | .00 |
| F | <i>Comandra pallida</i> | 3 | - | - | 1 | - | - | - |
| F | <i>Draba</i> spp. (a) | - | - | 8 | - | - | 3 | .01 |
| F | <i>Epilobium brachycarpum</i> (a) | - | - | 54 | - | - | 19 | .09 |
| F | <i>Erigeron divergens</i> | 1 | - | - | 1 | - | - | - |
| F | <i>Eriogonum umbellatum</i> | 18 | 30 | 21 | 8 | 13 | 9 | .20 |
| F | <i>Galium aparine</i> (a) | - | - | 39 | - | - | 18 | .23 |
| F | <i>Gilia</i> spp. (a) | - | - | 2 | - | - | 1 | .00 |
| F | <i>Hedysarum boreale</i> | _{ab} 12 | _b 14 | _a 3 | 6 | 6 | 1 | .15 |
| F | <i>Lactuca serriola</i> | - | 3 | 5 | - | 1 | 3 | .01 |
| F | <i>Lygodesmia grandiflora</i> | - | - | 3 | - | - | 1 | .03 |
| F | <i>Phlox longifolia</i> | _a - | _b 20 | _b 30 | - | 10 | 12 | .13 |
| F | <i>Polygonum douglasii</i> (a) | - | - | 12 | - | - | 5 | .02 |
| F | <i>Ranunculus testiculatus</i> (a) | - | - | 32 | - | - | 11 | .51 |
| F | <i>Sphaeralcea coccinea</i> | 13 | 18 | 24 | 5 | 6 | 10 | .22 |
| F | <i>Stephanomeria exigua</i> | 1 | - | - | 1 | - | - | - |
| F | <i>Tragopogon dubius</i> | _a 3 | _a - | _b 8 | 1 | - | 6 | .08 |
| F | Unknown forb-perennial | - | 1 | 3 | - | 1 | 1 | .00 |
| F | <i>Wyethia amplexicaulis</i> | _a 3 | _b 11 | _a - | 2 | 4 | - | - |
| F | <i>Zigadenus paniculatus</i> | _a - | _b 8 | _b 16 | - | 4 | 7 | .06 |
| Total for Annual Forbs | | 0 | 0 | 226 | 0 | 0 | 86 | 1.16 |
| Total for Perennial Forbs | | 63 | 117 | 143 | 31 | 51 | 64 | 3.14 |
| Total for Forbs | | 63 | 117 | 369 | 31 | 51 | 150 | 4.31 |

Values with different subscript letters are significantly different at $\alpha = 0.10$

BROWSE TRENDS --

Herd unit 16A, Study no: 1

| Type | Species | Strip Frequency '97 | Average Cover % '97 |
|------------------|-------------------------------|------------------------|------------------------|
| B | Acer grandidentatum | 3 | .56 |
| B | Artemisia tridentata vaseyana | 48 | 5.82 |
| B | Gutierrezia sarothrae | 36 | 2.38 |
| B | Quercus gambelii | 54 | 21.22 |
| Total for Browse | | 141 | 30.00 |

BASIC COVER --

Herd unit 16A, Study no: 1

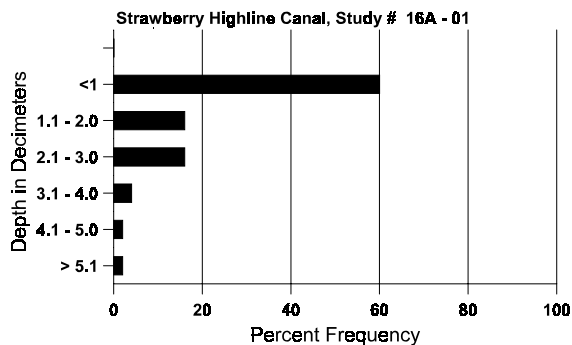
| Cover Type | Nested Frequency '97 | Average Cover % | | |
|-------------|-------------------------|-----------------|-------|-------|
| | | '83 | '89 | '97 |
| Vegetation | 328 | 1.75 | 4.50 | 40.80 |
| Rock | 98 | 2.50 | 1.75 | 2.99 |
| Pavement | 160 | 14.50 | 17.75 | 13.00 |
| Litter | 399 | 68.00 | 65.75 | 63.84 |
| Cryptogams | 22 | 3.50 | 0 | .10 |
| Bare Ground | 145 | 9.75 | 10.25 | 7.99 |

SOIL ANALYSIS DATA --

Herd Unit 16A, Study no: 01, Strawberry Highline Canal

| Effective rooting depth (in) | Temp °F (depth) | pH | %sand | %silt | %clay | %OM | PPM P | PPM K | dS/m |
|------------------------------|-----------------|-----|-------|-------|-------|-----|-------|-------|------|
| 21.0 | 51.5 (17.7) | 6.9 | 48.4 | 29.1 | 22.6 | 1.5 | 11.4 | 105.6 | .6 |

Stoniness Index



PELLET GROUP FREQUENCY --

Herd unit 16A, Study no: 1

| Type | Quadrat Frequency '97 |
|--------|--------------------------|
| Rabbit | 1 |
| Deer | 1 |

BROWSE CHARACTERISTICS --

Herd unit 16A, Study no: 1

| A G R E | Y R | Form Class (No. of Plants) | | | | | | | | | Vigor Class | | | | Plants Per Acre | Average (inches) Ht. Cr. | | Total |
|--|--------|----------------------------|----|---|------------------|---|---|-------------------|---|---|----------------|-----|------|------|--------------------|--------------------------------|-----|-------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | | | | |
| Acer grandidentatum | | | | | | | | | | | | | | | | | | |
| S | 83 | 4 | - | - | - | - | - | - | - | - | - | 4 | - | - | 133 | | 4 | |
| | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | |
| | 97 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | |
| Y | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | |
| | 89 | 2 | - | - | 1 | - | - | 5 | - | - | 8 | - | - | - | 266 | | 8 | |
| | 97 | - | - | - | 1 | - | - | 2 | - | - | 3 | - | - | - | 60 | | 3 | |
| M | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | - | 0 | |
| | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | - | 0 | |
| | 97 | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | 20 | 87 63 | 1 | |
| % Plants Showing | | <u>Moderate Use</u> | | | <u>Heavy Use</u> | | | <u>Poor Vigor</u> | | | <u>%Change</u> | | | | | | | |
| '83 | | 00% | | | 00% | | | 00% | | | | | | | | | | |
| '89 | | 00% | | | 00% | | | 00% | | | -70% | | | | | | | |
| '97 | | 00% | | | 00% | | | 00% | | | | | | | | | | |
| Total Plants/Acre (excluding Dead & Seedlings) | | | | | | | | | | | | '83 | 0 | Dec: | - | | | |
| | | | | | | | | | | | | '89 | 266 | | - | | | |
| | | | | | | | | | | | | '97 | 80 | | - | | | |
| Artemisia tridentata vaseyana | | | | | | | | | | | | | | | | | | |
| S | 83 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 33 | | 1 | |
| | 89 | 122 | - | - | 25 | - | - | 15 | - | - | 162 | - | - | - | 5400 | | 162 | |
| | 97 | 7 | - | - | - | - | - | - | - | - | 7 | - | - | - | 140 | | 7 | |
| Y | 83 | 11 | - | - | - | - | - | - | - | - | 11 | - | - | - | 366 | | 11 | |
| | 89 | 14 | - | - | 1 | - | - | 1 | - | - | 16 | - | - | - | 533 | | 16 | |
| | 97 | 26 | - | - | 1 | - | - | - | - | - | 27 | - | - | - | 540 | | 27 | |
| M | 83 | 22 | 10 | - | - | - | - | - | - | - | 27 | 5 | - | - | 1066 | 14 25 | 32 | |
| | 89 | 24 | 3 | - | 1 | - | - | - | - | - | 27 | 1 | - | - | 933 | 21 35 | 28 | |
| | 97 | 51 | 5 | - | - | - | - | - | - | - | 56 | - | - | - | 1120 | 24 34 | 56 | |
| D | 83 | 12 | 6 | - | - | - | - | - | - | - | 15 | - | 3 | - | 600 | | 18 | |
| | 89 | 16 | 2 | - | 3 | - | - | 3 | - | - | 20 | 1 | - | 3 | 800 | | 24 | |
| | 97 | 14 | 1 | - | 1 | - | - | - | 1 | - | 4 | - | - | 13 | 340 | | 17 | |
| X | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | |
| | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | |
| | 97 | - | - | - | - | - | - | - | - | - | - | - | - | - | 380 | | 19 | |
| % Plants Showing | | <u>Moderate Use</u> | | | <u>Heavy Use</u> | | | <u>Poor Vigor</u> | | | <u>%Change</u> | | | | | | | |
| '83 | | 26% | | | 00% | | | 05% | | | +10% | | | | | | | |
| '89 | | 07% | | | 00% | | | 04% | | | -12% | | | | | | | |
| '97 | | 06% | | | 00% | | | 13% | | | | | | | | | | |
| Total Plants/Acre (excluding Dead & Seedlings) | | | | | | | | | | | | '83 | 2032 | Dec: | 30% | | | |
| | | | | | | | | | | | | '89 | 2266 | | 35% | | | |
| | | | | | | | | | | | | '97 | 2000 | | 17% | | | |

| A G E | Y R | Form Class (No. of Plants) | | | | | | | | | Vigor Class | | | | Plants Per Acre | Average (inches) | | Total | |
|--|--------|----------------------------|---|---|------------------|---|---|-------------------|---|---|----------------|-----|------|------|--------------------|---------------------|-----|-------|-----|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | | Ht. | Cr. | | |
| Gutierrezia sarothrae | | | | | | | | | | | | | | | | | | | |
| S | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | | |
| | 89 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | 166 | | | 5 | |
| | 97 | 292 | - | - | - | - | - | - | - | - | - | - | - | - | 5840 | | | | 292 |
| Y | 83 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 33 | | 1 | | |
| | 89 | 37 | - | - | 2 | - | - | 2 | - | - | 41 | - | - | - | 1366 | | | 41 | |
| | 97 | 48 | - | - | - | - | - | - | - | - | 48 | - | - | - | 960 | | | | 48 |
| M | 83 | 36 | - | - | - | - | - | - | - | - | 36 | - | - | - | 1200 | 12 | 11 | | |
| | 89 | 99 | - | - | 2 | - | - | - | - | - | 101 | - | - | - | 3366 | 9 | 10 | 101 | |
| | 97 | 83 | - | - | - | - | - | - | - | - | 83 | - | - | - | 1660 | 7 | 7 | 83 | |
| D | 83 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 33 | | 1 | | |
| | 89 | 17 | 1 | - | - | - | - | - | - | - | 18 | - | - | - | 600 | | | 18 | |
| | 97 | 1 | - | - | - | - | - | - | - | - | 1 | - | - | - | 20 | | | | 1 |
| X | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | | |
| | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 | |
| | 97 | - | - | - | - | - | - | - | - | - | - | - | - | - | 20 | | | | 1 |
| % Plants Showing | | <u>Moderate Use</u> | | | <u>Heavy Use</u> | | | <u>Poor Vigor</u> | | | <u>%Change</u> | | | | | | | | |
| '83 | | 00% | | | 00% | | | 00% | | | +76% | | | | | | | | |
| '89 | | .62% | | | 00% | | | 00% | | | -50% | | | | | | | | |
| '97 | | 00% | | | 00% | | | 00% | | | | | | | | | | | |
| Total Plants/Acre (excluding Dead & Seedlings) | | | | | | | | | | | | '83 | 1266 | Dec: | 3% | | | | |
| | | | | | | | | | | | | '89 | 5332 | | 11% | | | | |
| | | | | | | | | | | | | '97 | 2640 | | 1% | | | | |
| Quercus gambelii | | | | | | | | | | | | | | | | | | | |
| S | 83 | 11 | - | - | - | - | - | - | - | - | 6 | 5 | - | - | 366 | | 11 | | |
| | 89 | - | - | - | 4 | - | - | - | - | - | 4 | - | - | - | 133 | | | 4 | |
| | 97 | 7 | - | - | 3 | - | - | - | - | - | 10 | - | - | - | 200 | | | | 10 |
| Y | 83 | 32 | - | - | - | - | - | - | - | - | 7 | 25 | - | - | 1066 | | 32 | | |
| | 89 | 52 | 6 | - | 16 | - | - | 26 | - | - | 100 | - | - | - | 3333 | | | 100 | |
| | 97 | 74 | - | - | 3 | - | - | - | 7 | - | 84 | - | - | - | 1680 | | | | 84 |
| M | 83 | 45 | - | - | 18 | - | - | - | - | - | 32 | 31 | - | - | 2100 | 43 | 27 | | |
| | 89 | 16 | - | - | 7 | - | - | 9 | - | - | 32 | - | - | - | 1066 | 71 | 41 | 32 | |
| | 97 | 206 | - | - | 12 | - | - | 3 | - | - | 221 | - | - | - | 4420 | 53 | 36 | 221 | |
| D | 83 | 4 | - | - | - | - | - | - | - | - | - | 4 | - | - | 133 | | 4 | | |
| | 89 | - | - | - | - | - | - | 1 | - | - | 1 | - | - | - | 33 | | | 1 | |
| | 97 | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | 20 | | | | 1 |
| X | 83 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | 0 | | |
| | 89 | - | - | - | - | - | - | - | - | - | - | - | - | - | 0 | | | 0 | |
| | 97 | - | - | - | - | - | - | - | - | - | - | - | - | - | 260 | | | | 13 |
| % Plants Showing | | <u>Moderate Use</u> | | | <u>Heavy Use</u> | | | <u>Poor Vigor</u> | | | <u>%Change</u> | | | | | | | | |
| '83 | | 00% | | | 00% | | | 00% | | | +26% | | | | | | | | |
| '89 | | 05% | | | 00% | | | 00% | | | +28% | | | | | | | | |
| '97 | | 00% | | | 00% | | | 00% | | | | | | | | | | | |
| Total Plants/Acre (excluding Dead & Seedlings) | | | | | | | | | | | | '83 | 3299 | Dec: | 4% | | | | |
| | | | | | | | | | | | | '89 | 4432 | | 1% | | | | |
| | | | | | | | | | | | | '97 | 6120 | | 0% | | | | |